Saskatchewan
Mineral Resources
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Survey

Report 186

Geology of the Maynard Lake-Sandy Narrows (West) Area

(NTS Area 63M-4 and 63M-3W)

by Blaine P. Scott

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Minister

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Deputy Minister

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Precambrian Geology Sector

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Abstract

The oldest rocks in the area consist of granitic gneiss and an assemblage of hornblende gneiss and metavolcanic rocks, pelitic rocks, semipelite, meta-arkose and metaconglomerate. The supracrustal assemblage occurs in two east-southeast-trending belts. Younger intrusive rocks consist of diorite, granodiorite, granite and pegmatite.

The dominant structure consists of tight to isoclinal folds, trending east-southeast and overturned to the southwest. The axial planes of younger folds trend north-northwest and northeast.

The common occurrence of staurolite in pelitic rocks and garnet in hornblende gneiss indicates amphibolite facies metamorphism.

Low-grade sphalerite and chalcopyrite mineralization occurs in brecciated semipelite east of Brownell Lake.

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(in pocket)

186A. Geology of the Maynard Lake-Sandy Narrows (West) Area, Saskatchewan

Introduction

Location and Accessibility

The area is located between 103°15′ and 104°00′ W longitude and 55°00′ and 55°15′ N latitude. It comprises the NTS areas designated Maynard Lake, 63M-4, and Sandy Narrows (West), 63M-3W.

The centre of the map area lies about 100 km east of La Ronge. Most lakes are small and connected by intermittent streams. The area is accessible by float-equipped aircraft, based at La Ronge and Pelican Narrows.

The western third of the map area was burnt in the mid sixties and is difficult to traverse because of deadfall and a heavy growth of jackpine. The central portion of the area, burnt in the early fifties, supports a forest of about 3 m in height. Forest of advanced maturity and parklike aspect covers the eastern part of the area. Windfall timber occurs between Palf Lake and the Northwest Arm of Deschambault Lake.

Physiography

Precambrian rock outcrop occupies about half the area. Topographic relief is commonly less than 15 m. Broad areas of muskeg occur in the north-central portion of the map area.

Glacial moraine consists of unsorted sandy clay with local cobbles and boulders. Glacial directions, indicated by striations on bedrock and crag-and-tail hills, are bimodal with maxima at 200°-210° and 185°-190° (Figure 1). The latter maximum includes the crag-and-tail hill data.

Previous Work

The map area forms the southwest corner of the Pelican Narrows Sheet(63-M) which was compiled by F. C. Taylor (1958) at a scale of 1 inch to 4 miles (1:253 440).

Field Work and Acknowledgments

The area was mapped by means of shoreline survey and pace-and-compass traverse lines spaced from 0.8 to 2.4 km apart.

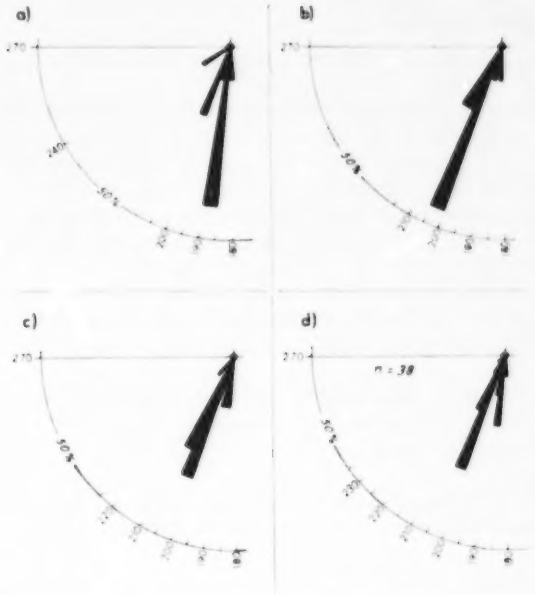

Figure 1. Glacial striae and crag-and-tail directions for: a) area 63M-4W, b) area 63M-4E, c) area 63M-3W, d) composite of all areas.

The writer was ably assisted in 1975 by Douglas Cruickshank, assistant geologist; Jeannine Viczko, cook; Karen Jordan and Henry Penner, geological assistants; and in 1976 by Dev Sharma, assistant geologist; Elsie DeRoose, cook; and Irene Lippelt and Peter Maw, geological assistants.

La Ronge Aviation Services Limited and Nipawin Air Services Limited provided efficient access to the area. The expediting of Duane Studer and Randy Studer of the departmental office at La Ronge is gratefully appreciated.

General Geology

Introduction

The area is entirely underlain by Precambrian rocks.

Granitic gneiss outcrops in the western half of the area. It displays sharp to gradational contacts with narrow bands of supracrustal rocks, and may be the oldest rock in the area. Supracrustal rocks occur in two east-southeast-trending belts, at Gee Lake and at Brownell Lake. Both belts contain hornblende gneiss and related metavolcanic rocks, pelitic rocks, semipelite, meta-arkose and metaconglomerate. Intrusive rocks, from oldest to youngest, comprise diorite, granodiorite and granite. Pegmatite dykes occur locally.

Staurolite occurs in pelitic rocks and garnet is common in hornblende gneiss and metavolcanic rocks, indicating metamorphism of amphibolite facies grade.

The numbering of supracrustal rocks in Table 1 is arbitrary and does not imply statigraphic position.

Table 1. Rock Units in the Area

Pleistocene-Recent	Glacial deposits, peat
	——————Unconformity——————
Precambrian	Pegmatite (Unit 10)
	——————Intrusive Contact ——————
	Granite (Unit 9)
	——————Intrusive Contact ——————
	Granodiorite (Unit 8) Diorite (Unit 7)
	——————Intrusive Contact ——————
	Metaconglomerate (Unit 6) Meta-arkose (Unit 5) Semipelite (Unit 4) Pelitic Rocks (Unit 3) Hornblende gneiss, associated metavolcanic rocks (Unit 2) Granitic gneiss (Unit 1)

Granitic Gneiss (Unit 1)

Granitic gneiss occurs with minor interbanded supracrustal rocks in a broad area between Brownell Lake and the northwest corner of the map area. Smaller bodies of Unit 1 outcrop at Maynard Lake, Mulligan Lake, east of Palf Lake, and between Park Lake and Horst Lake.

Granitic gneiss is equigranular, medium grained, reddish to light pink to light grey weathering, and darker coloured on fresh surfaces. Unit 1 is distinguished from granite (Unit 9) by its finer grain size, gneissic texture and variations in colour. Contacts with concordant supracrustal rocks vary from sharp to gradational. The **garnet-quartz diorite gneiss (Subunit 1a)** occurring east of Palf Lake has a rough surface due to differential weathering of rodded quartz lenses which comprise 20 to 40 percent of the rock.

Visible minerals include quartz, feldspar, garnet, hornblende, biotite and magnetite. Magnetite grains are locally surrounded by limonite-stained haloes up to 1 cm in diameter. Reddish zones are associated with a younger generation of red quartz veins.

This unit may have originated as an arkose, an acidic volcanic rock, or as an early granite.

Supracrustal rocks (Units 2 to 6) occur in Unit 1 in tabular to lensoid subrounded inclusions. These inclusions were once tabular and conformable bodies within Unit 1. On the southern shoreline of Wolverine Lake, hornblende gneiss is intruded by remobilized garnet-quartz diorite gneiss (Subunit 1a).

Hornblende Gneiss (Unit 2)

Hornblende gneiss, which occurs with related metavolcanic rocks and subunits rich in garnet and diopside, is the most common supracrustal rock in the area.

The rock weathers grey-green, but is darker green on the fresh surface. Outcrops are smooth and well rounded. Hornblende gneiss is well foliated, and slabby where sufficient biotite or chlorite are present. Flaggy "greenstone" outcrops on the islands near the south shore of Brownell Lake. The unit is fine to medium grained, with visible hornblende, actinolite, diopside, plagioclase, garnet and biotite.

Garnet-hornblende gneiss (Subunit 2a), with minor diopside gneiss bands, occurs in the southern supracrustal belt. Round garnets approach a diameter of 1.0 cm. Euhedral crystals are less common, measuring up to 4 mm in diameter. Most garnets are red, with gradations to light orange.

Metarhyolite (Subunit 2b) outcrops along a creek about 0.8 km north of Palf Lake. This rock is aphanitic, slightly foliated and pink weathering. Similar rocks occur between Jacques Lake and Kvamsing Lake, 4 km south of Mulligan Lake, and north of Northeast Arm, Deschambault Lake.

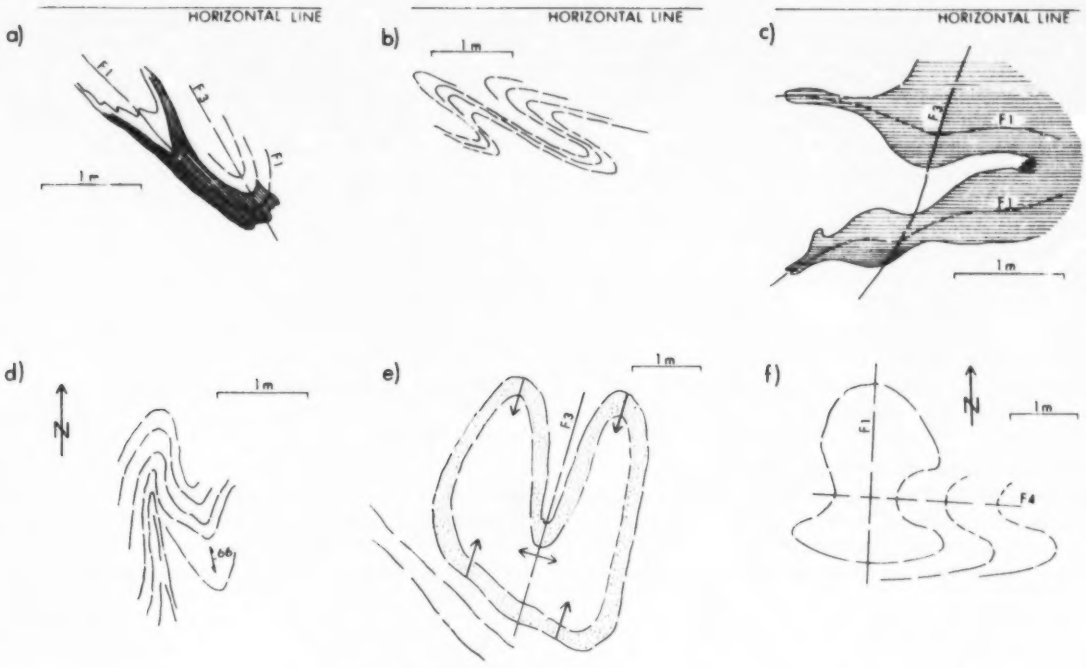

Figure 2. Fold styles in granitic gneiss: a) F_1 folds in granitic gneiss and garnet-biotite gneiss (shaded) folded about an F_3 axial plane; section viewed down-plunge, north shore of Carroll Lake; b) typical overturned F_1 folds; section looking north-northwest, south shore of Boehm Lake; c) F_1 folds in interbanded biotite gneiss (shaded) and granitic gneiss refolded by F_3; section looking north, near south shore of Boehm Lake; d) F_1 fold in granitic gneiss, axial plane trending 162° and dipping 66°E, south shore of Boehm Lake; e) F_1 basin trending 140°, southwest of Moose Lake; f) F_1/F_4 fold interference, southwest of Moose Lake.

Narrow bands of probable **metadacite (Subunit 2c)** outcrop on the shoreline of Wolverine Lake. This rock is fine grained and light grey weathering, with garnet and feldspar porphyroblasts up to 1.0 mm in diameter. A similar rock, but lacking garnet, occurs along the northwest shore of a small lake about 1.0 km northwest of Toro Lake. A light grey-green metadacite breccia outcrops on the southwest corner of an island in Gee Lake. The rock is composed of clasts of probable metadacite which contain about 6 percent biotite and 6 percent hornblende; the matrix of this rock contains about 4 percent biotite, 12 percent hornblende and no garnet.

Relict pillow structure occurs commonly in the northern supracrustal belt, and in one locality in the southern supracrustal belt. Meta-agglomerate occurs on the west shore of Wolverine Lake and on the shore of Maynard Lake, about 2.4 km northeast of the southwest corner of the map area (Plates 8A, 8B, 9A, 9B). At the Wolverine Lake occurrence, the rock contains rounded "andesitic" fragments and rare arkosic or dacitic clasts. Medium-grained plagioclase porphyroblasts comprise up to 75 percent of some fragments (Plate 8B).

Diopside gneiss (Subunit 2d) outcrops immediately northeast of Maynard Lake, and along Northeast Arm, Deschambault Lake. Visible minerals in this light green weathering rock include diopside, actinolite, hornblende, plagioclase, garnet, biotite and calcite.

Chloritization due to retrogressive metamorphism has greatly affected some areas of the hornblende gneiss, particularly between Darieu Lake and Hintz Lake. Hornblende gneiss in the northern belt of supracrustal rocks is nearly chlorite free. Concordant epidote-rich pods are common throughout the area.

Pelitic Rocks (Unit 3)

Pelitic rocks occur mainly in the northern belt of supracrustal rocks. This unit is distinguished from Unit 4 (semipelite) by containing more than 15 percent biotite. The pelitic rocks are fine to coarse grained, light grey-brown weathering, but darker on fresh surfaces. Foliation is commonly well developed. Outcrop surfaces are

smooth, except in varieties rich in coarse porphyroblasts of potassium feldspar, garnet or staurolite. Differential weathering occurs around amphibolitic and diopsidic pods in remobilized garnet-biotite gneiss on Mulligan Lake (Plate 4B). Biotite, muscovite, garnet, staurolite and feldspar are visible to the unaided eye. **Garnet-biotite gneiss (Subunit 3a)** contains up to 10 percent garnet.

Muscovitic pelite and semipelite (Subunit 3b) outcrops over a large area west of Vincent Lake. Individual pelitic and semipelitic layers range from less than one to several centimetres in thickness. Muscovite porphyroblasts up to 5 mm in diameter locally lie parallel to axial plane foliation in fold closures (Figure 3). East of Vincent Lake, Subunit 3b forms a migmatite complex with muscovitic granite (Subunit 9c).

Staurolite-garnet-biotite-muscovite gneiss (Subunit 3c) occurs in four localities: east of Palf Lake, at Staurolite Lake, along the western bay of Brownell Lake and along the southeastern shore of Brownell Lake. The staurolite is not readily visible to the unaided eye in muscovite schist at the last-mentioned occurrence. Elsewhere staurolite crystals are medium to coarse grained, randomly oriented within the S_2 plane of foliation and locally twinned at 30°. In thin sections most crystals, although euhedral in outline, contain a large number of unstrained inclusions. Pressure shadows adjacent to staurolite contain quartz. At the Palf Lake occurrence chlorite is a major matrix mineral, and euhedral to subhedral garnet crystals approach a diameter of 8 cm. The narrow band of staurolite gneiss situated about 3 km east of Horst Lake does not outcrop, but was located in a diamond-drill hole by Hudson Bay Exploration and Development Company Limited.

Fine-grained **phyllite (Subunit 3d)**, with a silky sheen on foliation planes, outcrops west of Gee Lake and west of Staurolite Lake.

Porphyroblastic garnet-feldspar-biotite gneiss (Subnit 3e) outcrops about 4 km northwest of Darieu Lake in a migmatite zone. Red garnets up to 5 mm and feldspars up to 2 cm in size occur in this exposure.

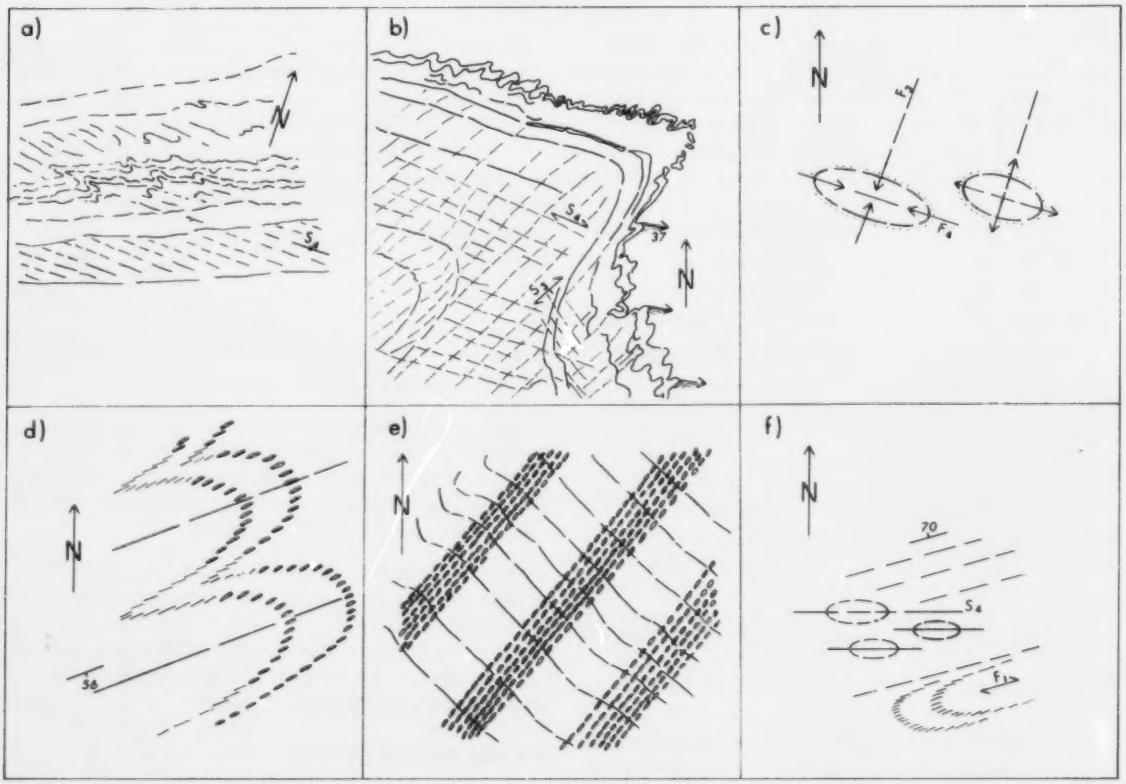

Figure 3. Structures in muscovitic pelite and semipelite, Vincent Lake: a) F_4 and parallel S_4 foliation overprinting S_1/S_2 (see Plate 6b); b) fold overprinted by S_3 and S_4 foliations; small-scale F_3 folds plunge at 37° (see Plate 7b); c) interference of F_3 and F_4, south bay of the lake; d) muscovite ellipsoids parallel to F_3 axial plane cleavage, western shore of the lake; e) muscovite ellipsoids parallel to F_3 axial planes; f) quartz-feldspar-muscovite ellipsoids parallel to S_4, north shore of the lake.

Semipelite (Unit 4)

Semipelite outcrops in the south half of the map area in hornblende gneiss, and is closely interbanded with muscovitic pelite at Vincent Lake (Plate 5B). In the first locality, the unit contains about 2 to 5 percent garnet and between 10 and 15 percent combined biotite and hornblende. The Vincent Lake occurrence is free of hornblende. The rock weathers light grey and is slightly darker on the fresh surface; it is uniformly fine grained with visible garnet, hornblende, biotite, muscovite, quartz and feldspar. At Brownell Lake, the main unit grades along strike into **semipelite interbanded with hornblende gneiss, pelite and meta-arkose (Subunit 4a)**.

Meta-Arkose (Unit 5)

Meta-arkose outcrops in narrow lenses throughout the area, and in a wide band at Maynard Lake. The meta-arkose contains less than 10 percent mafic minerals.

The rock is fine to medium grained, light grey to light grey-pink weathering and forms smooth well-rounded outcrops. A weak foliation is defined by muscovite grains oriented subparallel to layering. The layering is outlined by magnetite and biotite grains (Figure 4). Reddish zones, semiconcordant and sporadic in occurrence, result from hematite staining of muscovite.

Visible minerals include quartz, feldspar, muscovite, biotite, garnet, epidote and magnetite. Feldspar porphyroblasts and composites of feldspar grains up to 5 mm in diameter occur locally. Lenses rich in epidote reach dimensions of 3 by 300 cm. Magnetite forms discontinuous laminae and knots up to 3 cm in diameter.

Meta-arkose appears as a magnetic high on aeromagnetic Map 4822G (Saskatchewan Department of Mineral Resources and Geological Survey of Canada, 1970).

Metaconglomerate (Unit 6)

Metaconglomerate occurs between Maynard Lake and Brownell Lake, north of the northeast corner of Stilborn Lake and in two narrow bands northwest of Rustad Lake. The relative age of this unit is unknown; however, in one outcrop west of Rustad Lake, Unit 6 contains clasts identical to biotite gneiss in an adjacent outcrop, and in several places metaconglomerate grades across strike into meta-arkose.

The rock is polymictic, fine to medium grained, and light grey weathering. Clasts indicate advanced straining, with dimensions up to 15 cm long and 1 cm wide, and comprise as much as 80 percent of the rock. The matrix is mostly arkosic and contains about 5 percent garnet.

At an outcrop between two small lakes west of Rustad Lake, metaconglomerate contains clasts of porphyroblastic feldspar-biotite gneiss, fine-grained

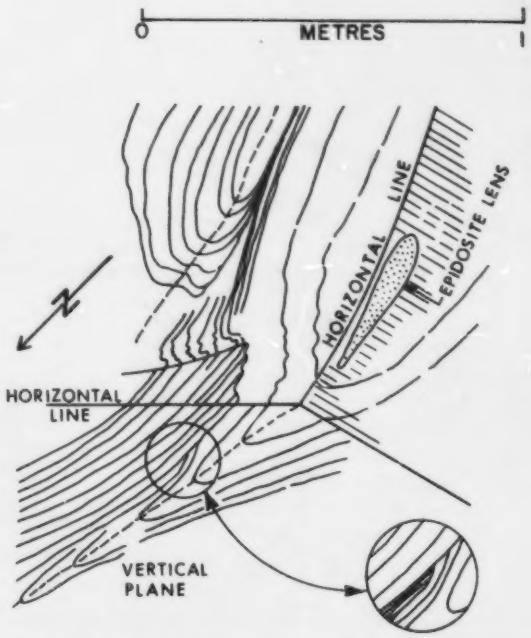

Figure 4. Early folded crossbedding in meta-arkose on small lake east of Maynard Lake (location X on Figure 5). Fold hinges are indicated by dashed lines.

garnet-hornblende gneiss, metamorphosed diorite and milky quartz. This occurrence is succeeded to the south by an outcrop of porphyroblastic feldspar-biotite gneiss, identical to clasts within Unit 6. To the north, the metaconglomerate grades into a pink pebbly meta-arkose containing well-rounded quartz pebbles up to 1.0 cm in size. Further north, the arkose grades into granitic gneiss.

Between Maynard Lake and Brownell Lake, a 5 m wide band of metaconglomerate occurs in fine-grained, dark grey feldspathic quartzite (Figure 5). The rock has a semipelitic matrix and contains clasts of garnetiferous pelite and milky quartz.

One narrow band of metaconglomerate occurs in granitic gneiss about 2.4 km north of the northeast corner of Stilborn Lake. Clasts consist of meta-arkose and hornblende gneiss, recrystallized to a uniform fine grain size.

Diorite (Unit 7)

Diorite occurs in late syntectonic sills in the hornblende gneiss and commonly grades into granodiorite or granite with hornblende gneiss inclusions. North of the Northwest Arm, Deschambault Lake a **garnetiferous diorite (Subunit 7a)** forms a migmatite complex with

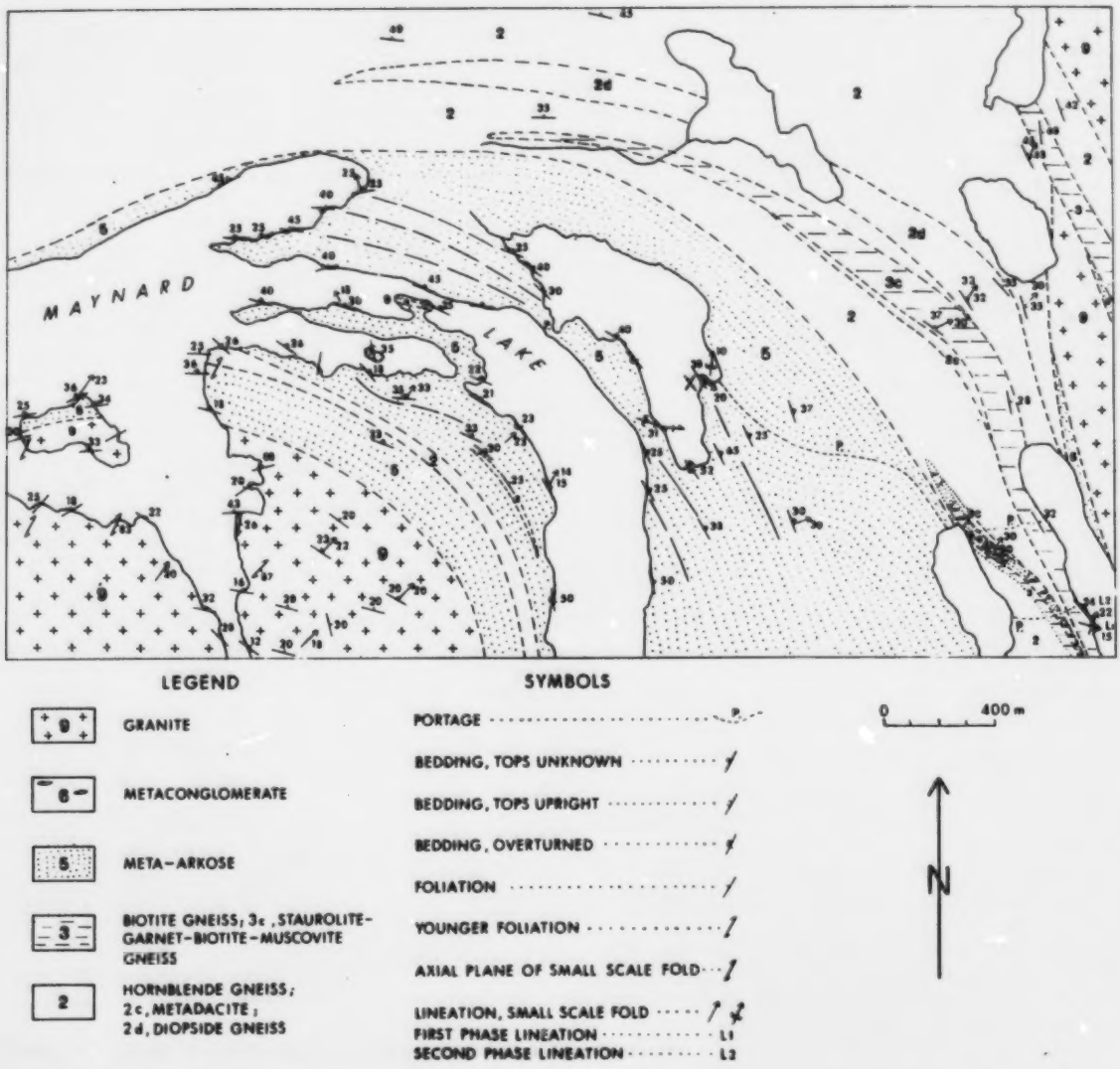

Figure 5. Detail of sedimentary structures, east end of Maynard Lake.

hornblende gneiss. Diorite comprises about 10 percent of the late intrusive rock suite (Units 7 to 9).

Unit 7 weathers grey-green, and is darker on the fresh surface. It is medium to coarse grained, poorly foliated and forms well-rounded outcrops. Visible minerals include hornblende, pyroxene, plagioclase, quartz and red garnet.

The plagioclase is in the range An_{20}-An_{50} (Moorhouse, 1959) and the rock contains less than 10 percent potassium feldspar and 5 percent quartz (i.e., the rock falls in the diorite field of a QAP diagram in which quartz, alkali feldspar plus albite, and plagioclase are calculated to the sum Q + A + P = 100). The main unit is gradational to **quartz diorite (Subunit 7b)** which contains between 5 and 20 percent quartz. Gabbro, which occurs locally, contains basic plagioclase (An_{50} and over) in excess of 95 percent of total feldspar (Moorhouse, 1959).

Pyroxenite (Subunit 7c) containing about 70 percent pyroxene phenocrysts, 25 percent talc and 5 percent hornblende, occurs immediately southeast of Sadler Lake, and on the island and southeast shore of Pyroxenite Lake.

Granodiorite (Unit 8)

Granodiorite* forms about 40 percent of the late intrusive rock suite in the area, commonly grading into diorite.

The granodiorite is equigranular, medium to coarse grained, and light grey to light pink on weathered and fresh surfaces. Outcrops are well rounded and massive to weakly foliated. Visible minerals include quartz, potassium feldspar, plagioclase, hornblende, garnet and biotite.

Granite (Unit 9)

Granite forms about 50 percent of the late intrusive rocks in the area, occurring in complexes with supracrustal rocks, notably northwest of Darieu Lake.

The rock is equigranular, medium to coarse grained, light grey to light pink, and weakly foliated. Most outcrops are well rounded. Visible minerals include quartz, potassium feldspar, plagioclase, biotite, hornblende, garnet and muscovite. Coarse-grained megacrystic granite, with megacrysts of potassium feldspar up to 5 cm long, occurs in an area bounded by Lovell Lake on the east and Lueder Lake and Desjardins Lake on the west; this rock is leucocratic and poorly foliated, with euhedral light grey crystals of potassium feldspar in a medium-grained matrix. A megacrystic granite outcrops about 3 km northeast of Lepp Lake. The potassium feldspar crystals are locally poorly formed, giving the appearance of a porphyroblastic gneiss.

Muscovite granite (Subunit 9b) occurs northeast of Lepp Lake, and at Vincent Lake where it forms a complex with muscovitic pelite and semipelite. Sporadic lenses of Subunit 9b occur in a zone within 5 km west of the west shore of Vincent Lake.

* The writer follows the usage in which granite contains 20 to 60 percent quartz and from 10 to 65 percent plagioclase, while granodiorite contains the same range of quartz content and 65 to 90 percent plagioclase (Streckeisen, 1976).

Narrow dykes of aplogranite outcrop mainly in the western half of the map area. Aplogranite is fine grained and varies in colour from light pink to light grey to light brown. Approximately 40 percent of the dykes trend within 10° of north and dip subvertically; another 40 percent trend between 095° and 135° and dip at moderate angles to the north; 20 percent trend between 135° and 170°.

Pegmatite (Unit 10)

Pegmatite outcrops in narrow dykes and semiconformable sills mainly in granitic gneiss in the western portion of the map area. Sills of granite and pegmatite are common in a zone trending southeast of Boehm Lake.

The pegmatites, which are commonly massive, pink weathering and coarse grained, contain coarse books of mica and are probably granitic in composition. White-weathering **tourmaline pegmatite (Subunit 10a),** with crystals of black tourmaline up to 5 cm in diameter, outcrops on islands and along the south shore of Northwest Arm, Deschambault Lake. On the north shore of Stilborn Lake, a swarm of tourmaline crystals occurs with muscovite in a quartz vein. The black crystals trend about 120°, parallel to vein contacts, and reach dimensions of about 3 by 20 mm.

Beryl pegmatite (Subunit 10b), of a distinctively weathered brick red colour, occurs at Stilborn Lake and Vincent Lake. At the former locality, two light green beryl crystals about 0.5 by 4 cm in size occur with garnet in the coarser component of a composite dyke which trends 170° and dips 80°W. The finer grained component contains about 2 percent red garnet. On the northwest shore of an island in Vincent Lake, two beryl crystals occur in a pegmatite dyke cutting muscovitic pelite and semipelite. Tourmaline crystals occur in both the host gneiss and the dyke.

Structure

Folding

The dominant structure in the area consists of tight to isoclinal, east-southeast-trending folds whose limbs and axial planes are overturned to the south. Lineations consist of aligned quartzofeldspathic segregations and hornblende, plunging to the east at shallow to moderate angles.

A major cross fold, the Deschambault Lake Synform, trends north-northwest across the eastern part of the area. Lineations plunge at moderate angles, subparallel to the fold axial plane. Originating in the Glennie Lake area, the synform becomes progressively tighter in a southerly direction. It is probably related to north-trending folds east of the Tabbernor Fault.

The east-southeast-trending folds and the Deschambault Lake Synform are overprinted by a set of *en echelon* folds with upright, north- to northeast-trending axial planes. These folds plunge between the northwest and northeast in azimuth, at moderate angles. The Massey Lake, Maynard Lake and Brownell Lake Antiforms are commonly broad open warps; however, amplitude: wavelength ratios are approximately 1 where wide bodies of intrusive rock occur. Tight to isoclinal folds occur in the northwest corner of the map area and near Mulligan Lake.

Small-scale folds with east-trending axial planes and easterly plunges occur on the west shore of Lepp Lake and at Vincent Lake. Axial surfaces dip moderately south at the latter occurrence.

Faulting

Several faults occur parallel to regional S_1 foliation. Two faults occur in granite southwest of Palf Lake, indicated by a talc schist zone trending 090° and dipping 82° N, and by a quartzofeldspathic mylonite trending 065° and dipping 73° N. About 0.5 km southeast of Staurolite Lake, a shear zone in hornblende gneiss trends 115° and dips 72° N. Lineations parallel to the direction of movement plunge toward 023° at (–) 70°. Three kilometres to the east-southeast along strike, the same fault trends 120° and dips 75° N in a garnetiferous talc schist zone. Brecciated rock, possibly meta-arkose, on the northwest island in Wolverine Lake is on strike with a possible fault lineament.

In the western two-thirds of the area, transverse faults trend between 320° and 010° azimuth. Two faults located northwest and northeast of Rustad Lake have small left-hand translation, indicated by the apparent offset of fold axial planes. In the southeast bay of Hintz Lake, shear zones in diorite trend 140° and dip 72° N.

Structural History

It is assumed that supracrustal rocks were deposited on a craton of granitic gneiss. During subsequent deformation (D_1), tight to isoclinal east-southeast-trending folds (F_1), plunging gently to moderately eastward, formed in the craton and the supracrustal rocks. Interpretation of aerial photographs indicates a complex pattern of domes and basins in the core of the craton. Late in D_1, they were folded about an east-west axial plane, indicated by large dots between Park Lake and Massey Lake on Map 186B. Other domes and basins may be present; however, most fold closures in granitic gneiss were erased by late first phase foliation (S_1). Granodiorite-diorite intrusive activity may have occurred late in D_1.

During the second major deformation (D_2), a broad north-northwest-trending synform developed, extending from the Glennie Lake area to Deschambault Lake. The area east of the Tabbernor Fault was affected by D_2 to a vastly greater degree. Granite was intruded semiconcordantly during D_2.

The third major deformation (D_3) produced a set of *en echelon* folds which locally overprinted F_1 and F_2 folds. Granitic activity concluded during D_3.

The final deformation (D_4) produced only local, small-scale effects, observed at Lepp Lake and Vincent Lake.

Metamorphism

The area bears the imprint of amphibolite facies metamorphism, indicated by the presence of staurolite in pelitic rocks and garnet and hornblende together in hornblende gneiss and associated metavolcanic rocks. Amphibolite facies conditions probably accompanied the D_1, D_2 and D_3 deformations.

Retrograde metamorphism under upper greenschist facies conditions accompanied late D_3 and D_4 deformations. Chloritization of mafic minerals occurred in both belts of supracrustal rock. Parts of the diorite plutons were heavily chloritized. Epidote-rich lenses formed in hornblende gneiss and meta-arkose in the southern belt of supracrustal rock. Muscovite porphyroblasts developed in pelitic and semipelitic rock in the northern supracrustal belt.

In the southern belt of supracrustal rocks, sufficient strain and recrystallization occurred during D_1 to obliterate most primary structures. In the northern supracrustal belt, pillow structure in metavolcanic rock and bedding planes in metasedimentary rock (Plate 5B) are more frequently observed.

Economic Geology

General

Rare specks of chalcopyrite were found in hornblende gneiss (Unit 2) in the southern portion of the map area during the present survey. Pegmatite dykes with sparse beryl crystals were found at Vincent Lake and Stilborn Lake.

Hudson Bay Mining and Smelting Company Limited drilled a number of EM anomalies in the northern belt of supracrustal rocks. Pyrite, pyrrhotite, graphite and traces of chalcopyrite occur within pelitic rocks and hornblende gneisses coincident with these EM conductors. Values of 3.3 percent Cu and 9.2 percent Zn where intersected near a hornblende gneiss-granodiorite contact about 3 km northeast of Horst Lake. Slight amounts of pyrrhotite, pyrite, chalcopyrite and graphite occur along a contact between the hornblende gneiss and staurolite-garnet-biotite gneiss, east of Horst Lake.

Selco Exploration Company Limited drilled a magnetic conductor in the northwest bay of Brownell Lake, locating a graphite-pyrrhotite-bearing zone.

Lorando Uranium Mines Limited carried out trenching and diamond-drilling on an island in Wood Lake, about 6.3 km south of the northeast corner and 0.6 km west of the east boundary of the map area. Scattered specks of pyrrhotite, pentlandite, chalcopyrite and pyrite occur in gabbro; one trench sample assayed 0.5 percent Cu and 0.46 percent Ni. Diamond drills bottomed in gabbro, with values up to 0.19 percent Cu and 0.16 percent Ni.

Brownell Lake Property

In 1958, a Cu-Zn sulphide zone was found by the Canadian Nickel Company Limited immediately east of Brownell Lake on CBS 969 (Figure 6). The company conducted geophysical work and diamond-drilling between 1958 and 1969. La Ronge Mining Company Limited acquired the property in 1969 and carried out further geophysical work. The 1969 geophysical survey outlined EM conductive zones with magnetic correlation trending east-west across the property. Six diamond-drill holes were put down to test these zones; results are given in Table 2.

In 1978, geological mapping and soil geochemistry were carried out on the property as part of the present study.

The mineralization is hosted in brecciated semipelites that are interbanded with hornblende gneisses. Mineralization is low grade and consists of fine-grained sphalerite and chalcopyrite with minor pyrite, marcasite, pyrrhotite and magnetite in breccia zones that lie within and adjacent to semipelite. A profile along section line 24+00E (Figure 7) includes drill holes 0-1, 0-2, 0-3 and 0-6, and indicates a zone of mineralized breccia, subparallel to foliation, dipping about 60° N. Other zones, located by drill holes 0-4 and 0-5, are projected at an assumed dip of (−) 55° to surface, where they coincide with soil Cu and Zn anomalies.

At the Brownell Lake property, a reddish B horizon of oxide and clay enrichment below a leached A_2 layer,

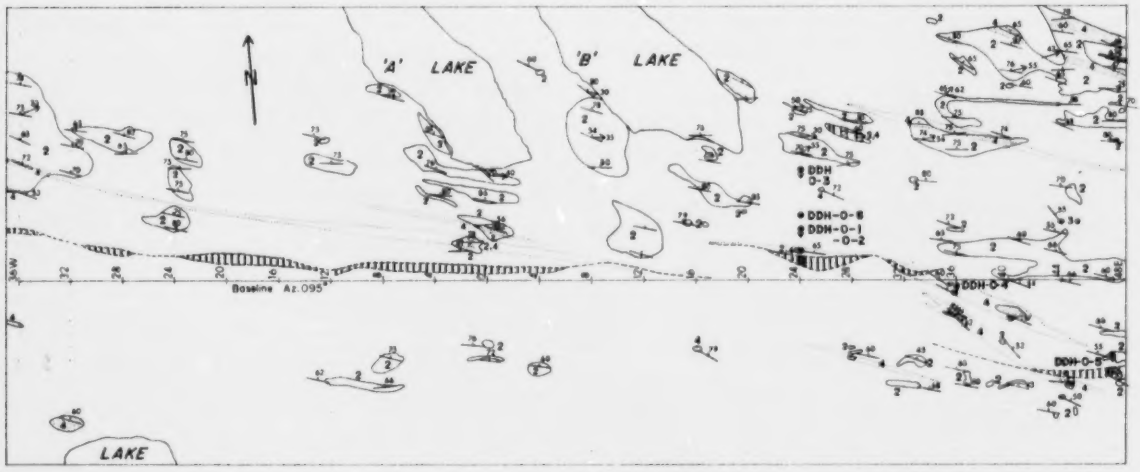

Figure 6. Sketch map of geology, Brownell Lake property.

Table 2. Diamond-Drill Data, Brownell Lake Property

Drill Hole	Azimuth	Declination	Inclined Depth (m)
0-1	185	(−) 45	160
0-2	185	(−) 60	133
0-3	185	(−) 50	219
0-4	185	(−) 50	185
0-5	185	(−) 50	183.5
0-6		(−) 90	159

Average Assays

Drill Hole	Inclined Depth (m)	Sampling Interval (m)	Cu (percent)	Zn (percent)	Au (oz/ton)	Ag (oz/ton)
0-1	66.5-67.5	1.0	0.75	0.95	Trace	0.24
	68.4-68.8	0.4	0.18	0.06	Trace	Trace
	71.5-71.8	0.31	0.2	0.11	Trace	Trace
0-2	72.2-72.5	0.37	0.92	1.23	0.02	0.66
	73.3-73.6	0.31	0.33	0.07	0.01	Trace
	76.0-76.6	0.61	0.14	0.25	0.02	1.04
0-3	195.8-196.2	0.61	0.21	3.82	Trace	0.24
	197.5-198.0	0.61	0.34	1.22	0.01	0.23
	198.0-199.0	0.90	0.35	0.99	0.01	Trace
	199.0-200.0	0.98	0.37	1.48	0.01	0.23
	201.0-201.5	0.46	0.12	0.26	Trace	Trace
0-4	44.2-45.0	0.79	0.3	0.93		
	49.4-49.7	0.37	1.27	0.60		
	51.0-52.5	1.52	0.57	0.13		
	52.5-54.0	1.52	0.59	0.22		
	54.0-55.5	1.52	0.02	1.46		
	155.0-155.5	0.61	0.07	0.02		
	156.0-157.0	0.76	0.08	0.42		
0-5	51.0-51.6	0.61	0.95	0.64		
	71.0-71.7	0.76	0.35	0.10		
	81.4-81.7	0.37	0.01	0.15		
	105.6-106.1	0.61	0.02	0.06		
0-6	136.8-137.8	0.9	0.5	2.48	0.08	0.26
	137.8-139.0	1.52	0.69	2.26	0.04	0.26
	139.0-140.0	0.9	0.11	2.10	0.01	Trace
	143.5-144.7	1.07	0.21	0.08	Trace	Trace

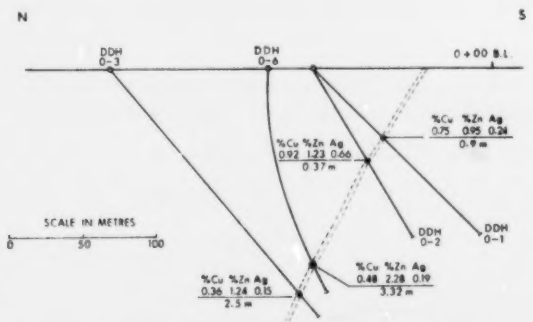

Figure 7. Profile of section line 24+00E, looking east, Brownell Lake property. Silver values are in oz/ton.

typical of a podsol, is developed upon glacial till and clay deposits (Table 3). The frequent lack of A_2 and B horizons may reflect immaturity of the soil.

Soil samples from the A_1 and B horizons were taken at 31 m (100 ft.) intervals along section lines spaced 122 m (400 ft.) apart. Where the B horizon was not developed, the top of the C horizon was sampled. Samples were analyzed by Trevor Jones at the University of Regina, using atomic absorption, for Cu, Pb, Zn, Ni, Co, Fe, Mn, Mo, V and loss on ignition. Results for Cu and Zn are presented in Figures 8 and 9.

In order to define threshold and background values, a graphical method (Parslow, 1974) was used. Background is taken as the midpoint of the sigmoidal

Table 3. Characteristics of Soil Profile, Brownell Lake Property

Soil Horizon	Thickness (cm)	Description
A_{00}	3-20	Unaltered leaf material
A_0	0-3	Partly decomposed leaf material
A_1	0-1	Black mixture of decomposed leaf material and charcoal
A_2	0-2	Light grey silty clay; sharp contact with B
B	0-3	Reddish brown; grades into C
C		Light to medium grey sandy clay; pebbles

curve of inflection between the background population and the anomalous population, plotted on logarithmic probability paper. By extending the background curve to the right of the diagram, thresholds are obtained at M + σ, M + 2σ and M + 3σ, where M is the mean and σ equals one standard deviation. For this study, Cu threshold values taken at 2σ and 3σ are 45 and 75 ppm for the A_1 horizon, and 41 and 74 ppm for the B horizon. Similarly, Zn values taken at 2σ and 3σ are 108 and 200 ppm for the A_1 horizon and 74 and 122 ppm for the B horizon (Figures 10 and 11). To distinguish trends from isolated high values, Parslow's method of using large dots for values greater than M + 3σ and small dots for values between M + 2σ and M + 3σ was adopted.

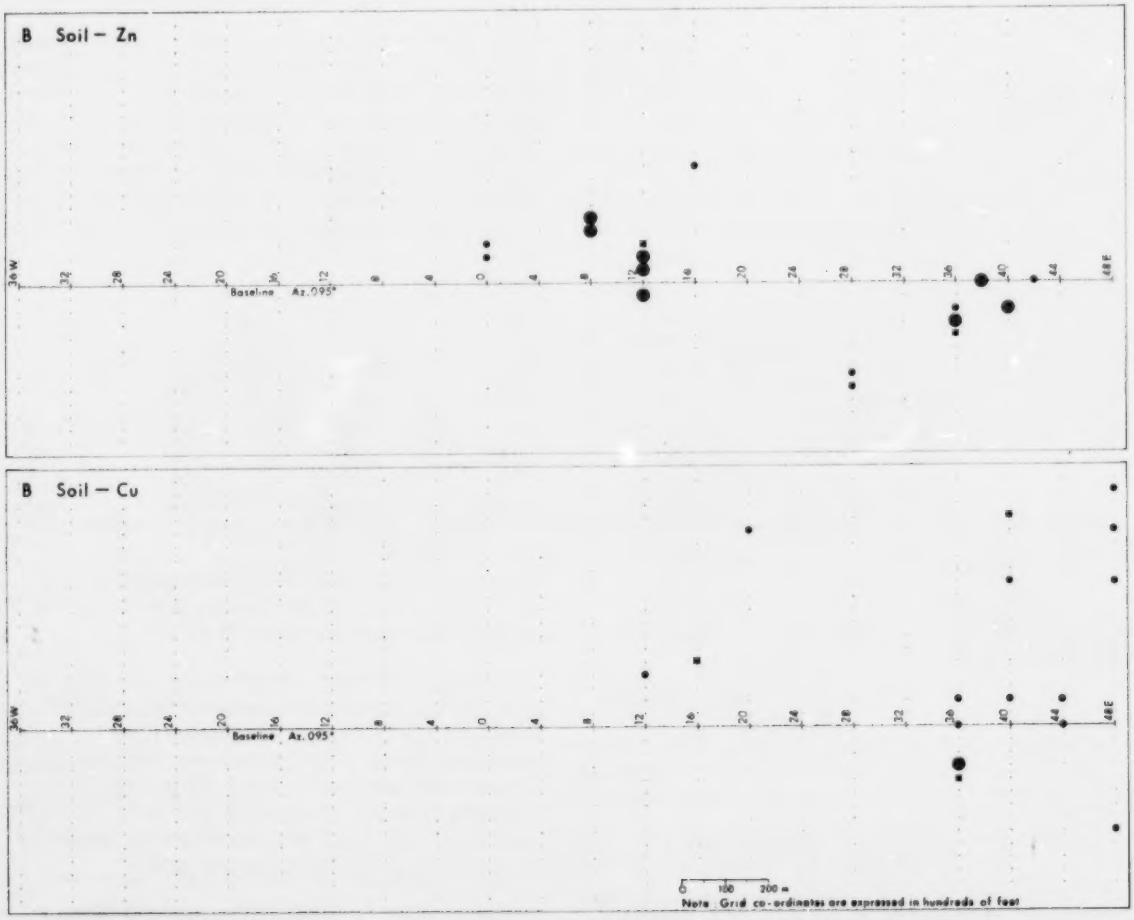

Figure 8. Copper and zinc, A_1 soil horizon, Brownell Lake property. Small circles represent values between M+2σ and M+3σ; large circles represent values greater than M+3σ.

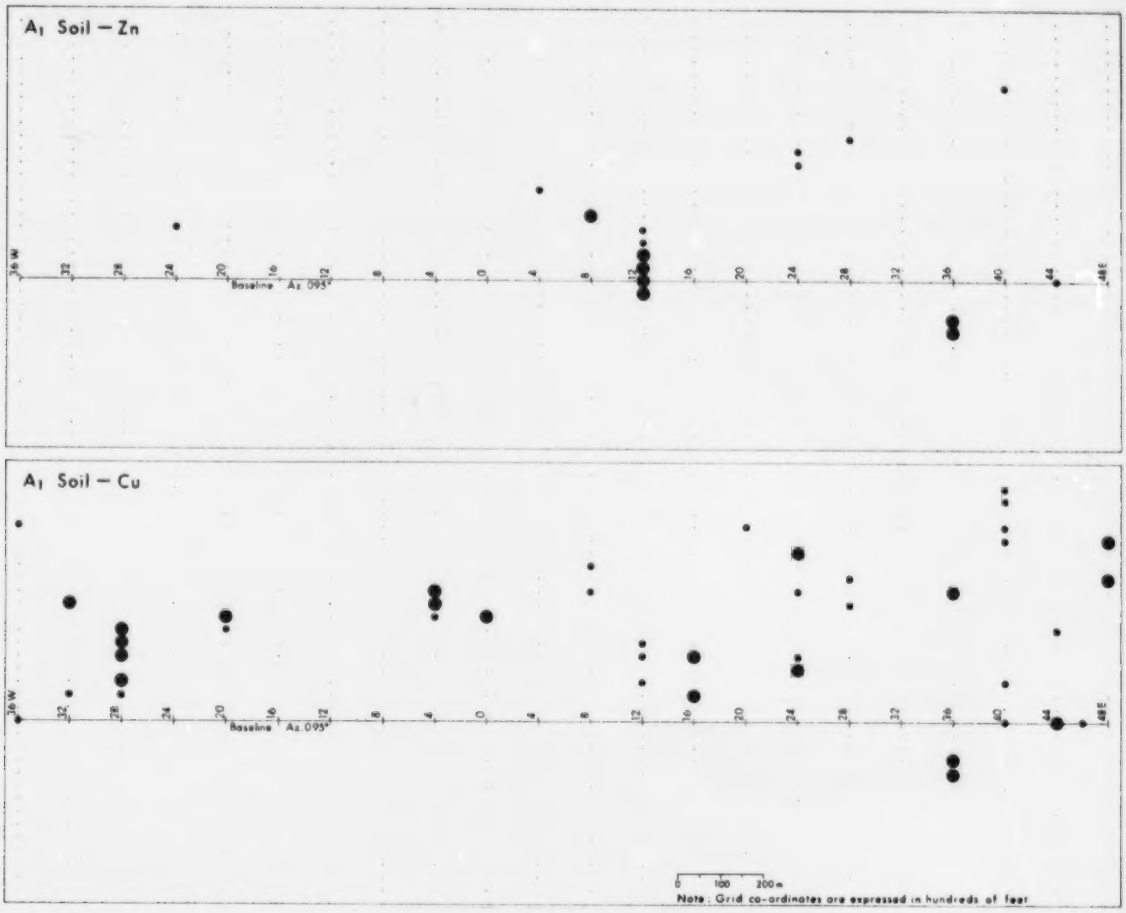

Figure 9. Copper and zinc, B soil horizon, Brownell Lake property. Small circles represent values between M+2σ and M+3σ; large circles represent values greater than M+3σ.

On the logarithmic probability graphs, the curves for Cu and Zn in the A_1 horizon are steep in the upper population (M + 3σ), indicating possible economic potential (Cameron and Baragar, 1971). The relatively weak response of the B horizon is probably due to the immaturity of the podsol.

Plots of the copper and zinc content in the A_1 and B horizons indicate trends coincident with sulphide bodies located in the eastern half of the property (Figures 6, 8 and 9). One Cu trend extends east-southeast from the south limit of 'A' Lake to the east side of the property. Although not detected by the geophysical survey, this trend may indicate sporadic chalcopyrite mineralization along a narrow zone. Another weak zone is indicated trending east-southeast from the northeast shore of 'B' Lake. No explanation is offered for the high Cu values in A_1 soils on the 28W section line.

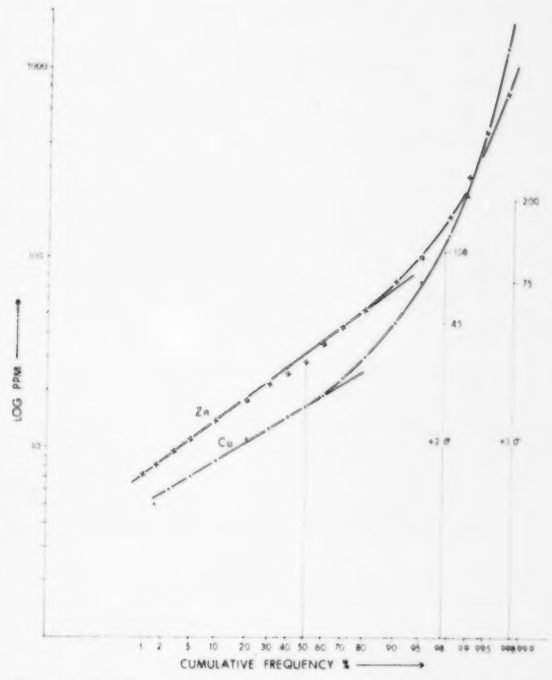

Figure 10. Cumulative frequency distributions for copper (dots) and zinc (crosses) in A_1 horizon, Brownell Lake property. Plotted on logarithmic probability paper.

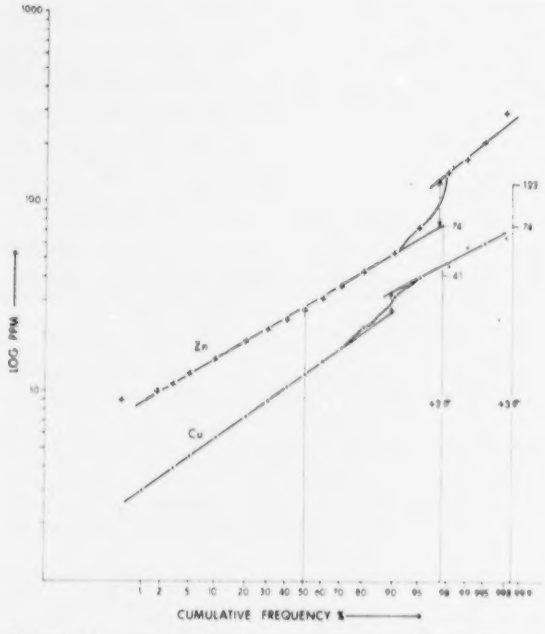

Figure 11. Cumulative frequency distributions for copper (dots) and zinc (crosses) in B soil horizon, Brownell Lake property. Plotted on logarithmic probability paper.

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Taylor, F. C. (1958): Pelican Narrows, Saskatchewan; Can., Geol. Survey, Map 1-1958 (with marginal notes).

Plate 1a. Canoe-shaped fold in hornblende gneiss (Unit 2) and granitic gneiss (Unit 1), south shore of Moose Lake, 3.6 km east of west boundary of map area.

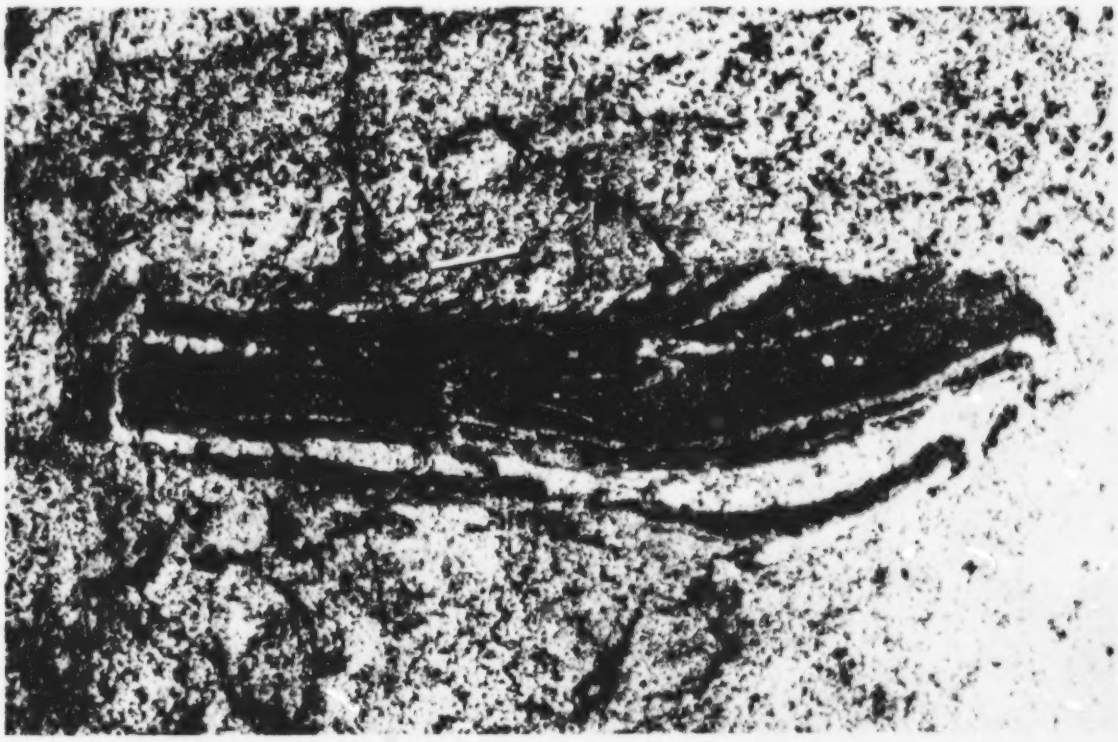

Plate 1b. Hornblende gneiss inclusion in partly remobilized granitic gneiss (Unit 1), south shore of Moose Lake, 2.5 km east of west boundary of map area.

Plate 2a. *Overturned crossbeds in meta-arkose (Unit 5), viewed down-dip in a southeasterly direction, on the southwest shore of a small lake immediately east of Maynard Lake (Figure 5).*

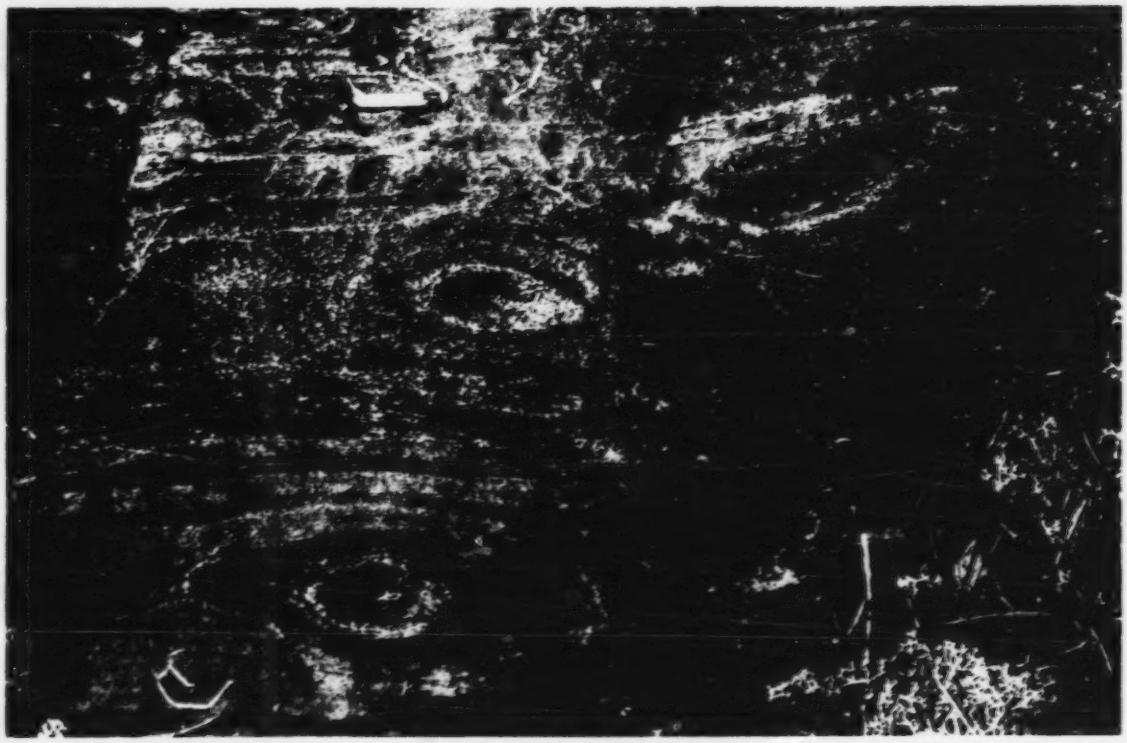

Plate 2b. *Lenses with hornblendic rims and probable calcite-diopside cores in interbanded hornblende gneiss and semipelite, northwest bay of Staurolite Lake.*

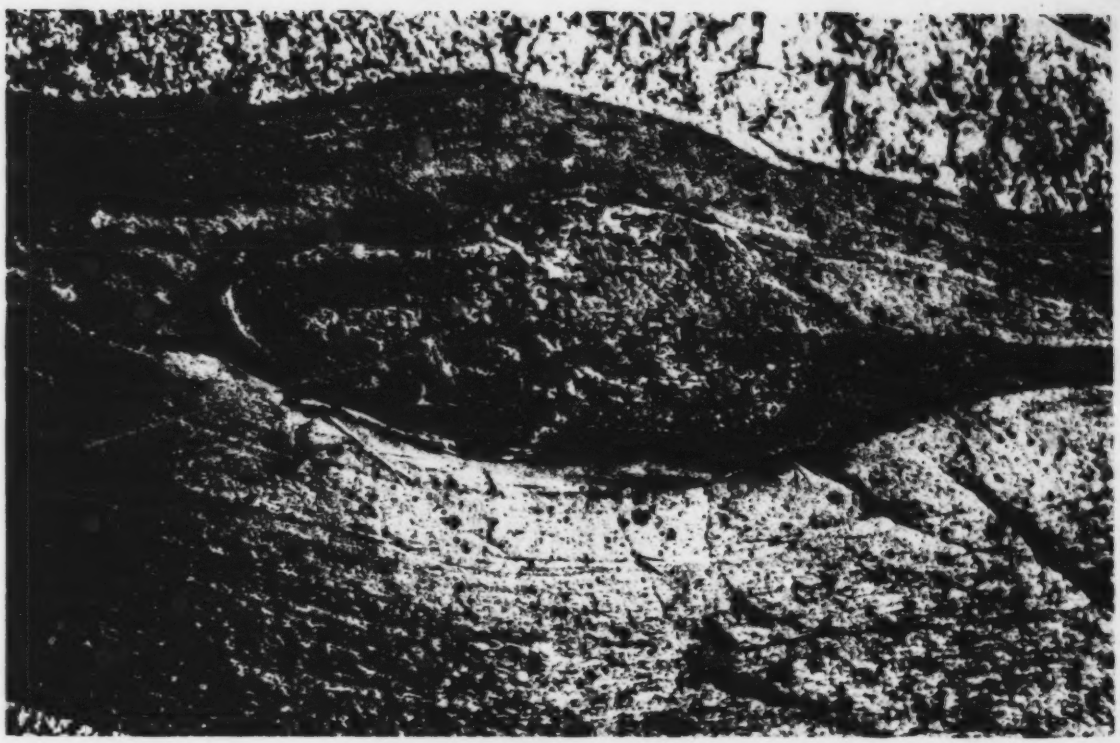

Plate 3a. Quartz-feldspar-actinolite lens, overprinting S_1 surfaces in muscovitic pelite and semipelite (Subunit 3b), west side of island, Vincent Lake, 0.72 km south of north boundary of map area.

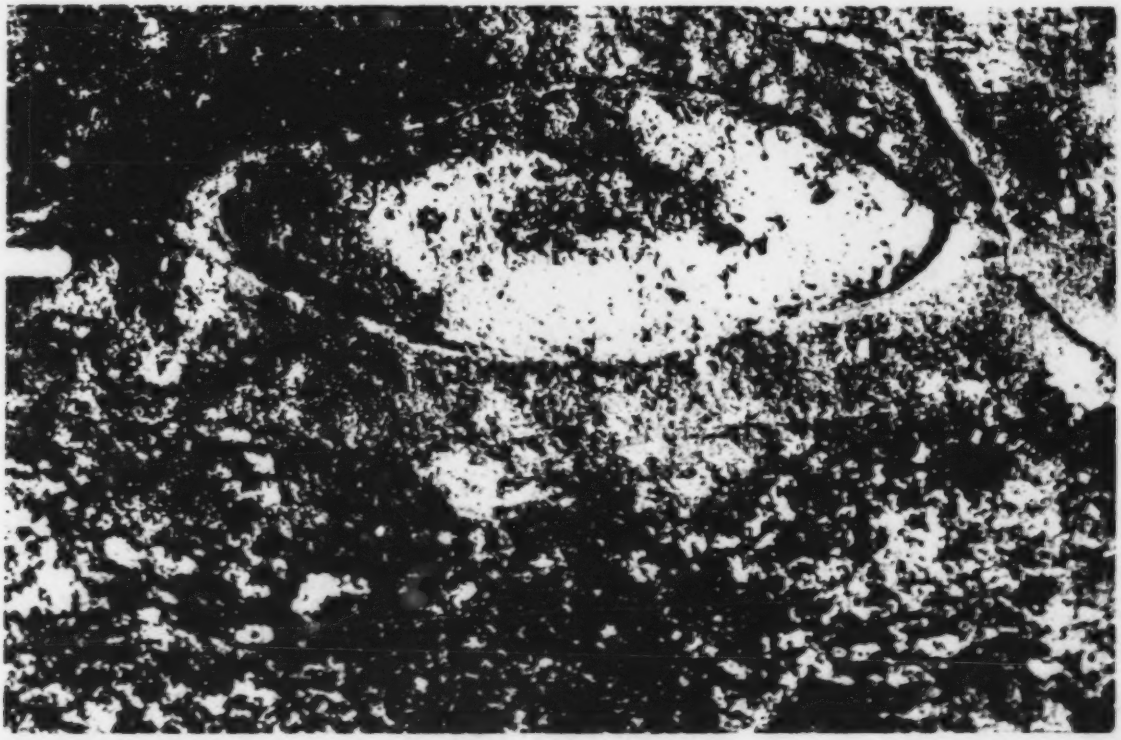

Plate 3b. Lens containing staurolite and garnet in garnet-biotite gneiss (Subunit 3a), southwest bay of Staurolite Lake.

Plate 4a. *Folded hornblendic boudins and pods in remobilized pelitic rock (Unit 3), 1.7 km east-southeast of dock on Mulligan Lake and 1.6 km south of north boundary of map area.*

Plate 4b. *Hornblendic and diopsidic inclusions in remobilized garnet-biotite gneiss (Subunit 3a) on island near centre of Mulligan Lake. Inclusions represent disturbed hornblendic and diopsidic bands.*

Plate 5a. *Staurolite-garnet-biotite-muscovite gneiss (Subunit 3c), south shore of Staurolite Lake. The scale is 5 cm long.*

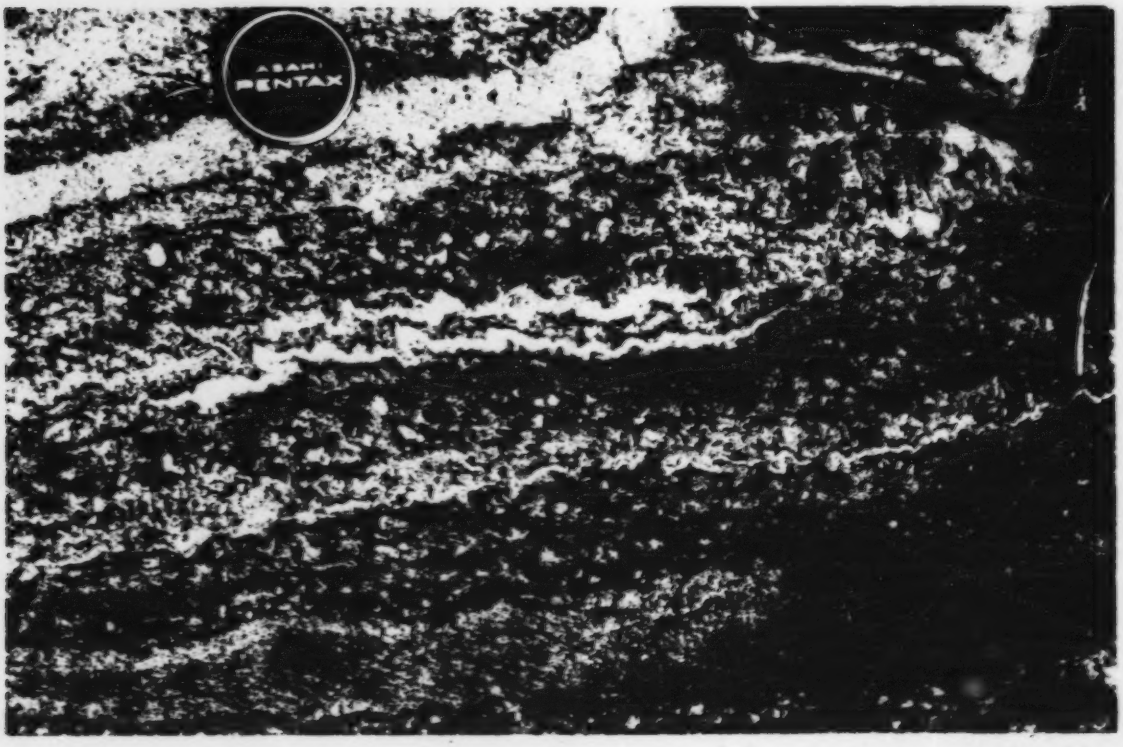

Plate 5b. *Muscovitic pelite and semipelite (Subunit 3b) with transverse S_4 cleavage and F_4 folds, southwest bay of Vincent Lake.*

Plate 6a. *Feldspar porphyroblasts, oriented at right angles to S_1, in musovitic pelite and semipelite (Subunit 3b), east shore of small island, Vincent Lake.*

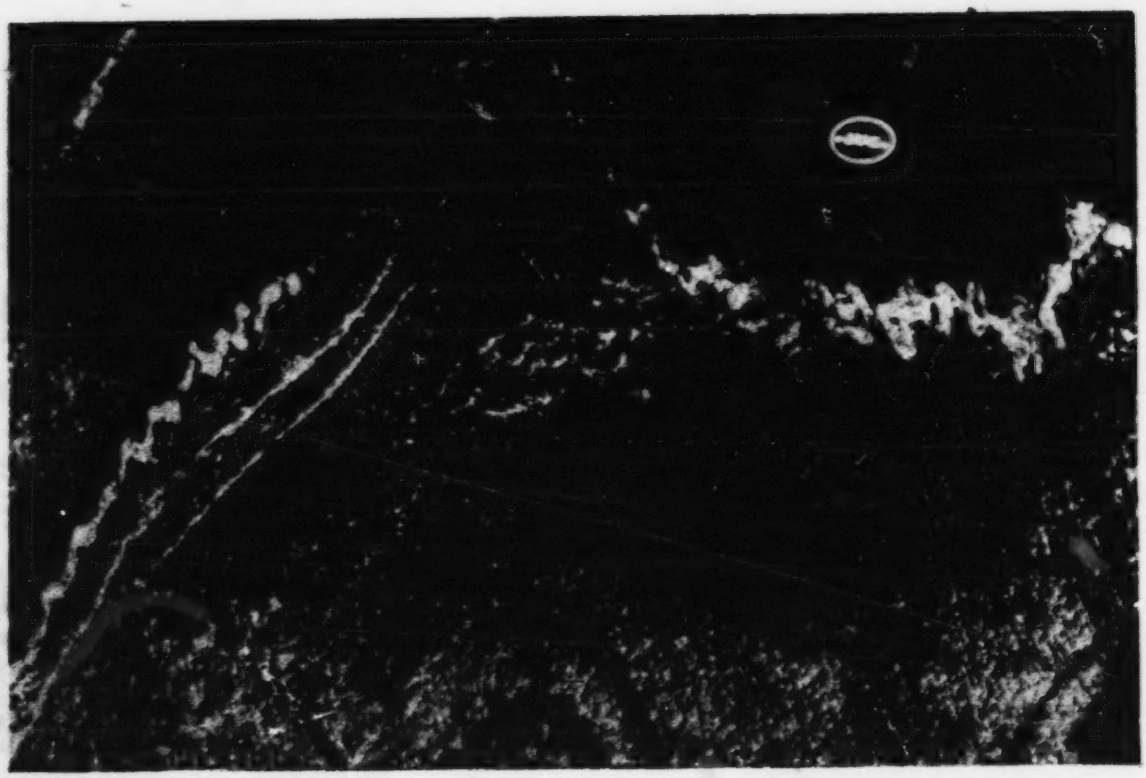

Plate 6b. *Two foliations in folded muscovitic pelite and semipelite (Subunit 3b), east shore of large island, Vincent Lake (Figure 3b).*

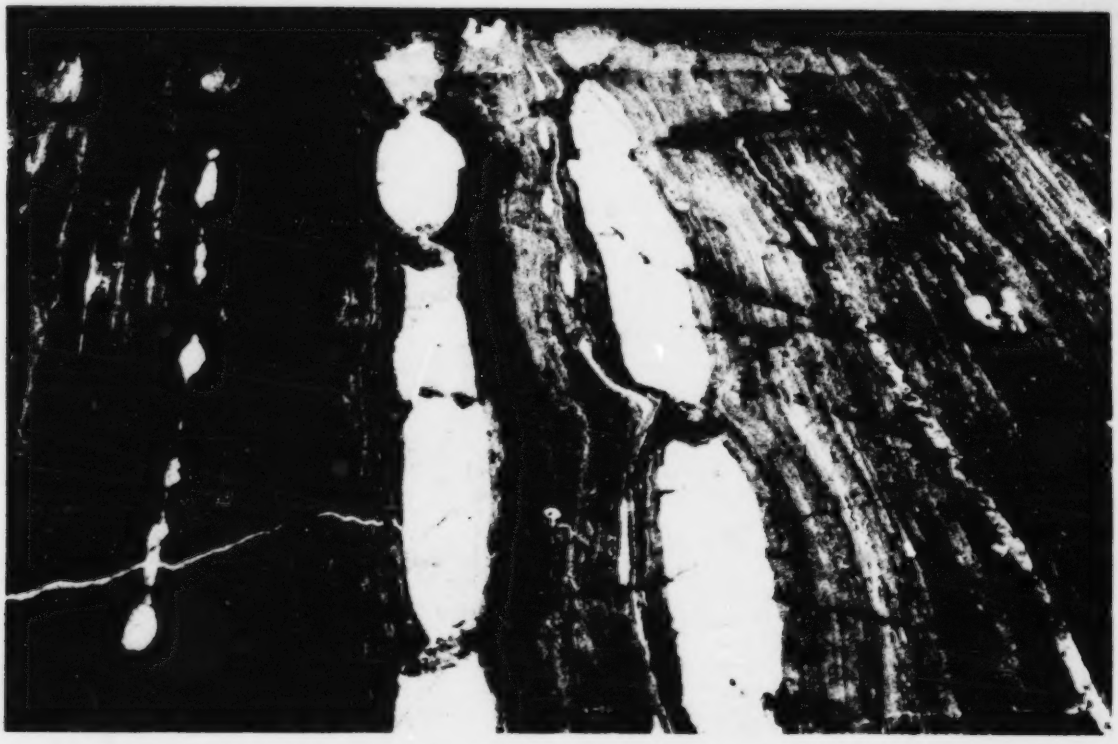

Plate 7a. *Boudinaged late granite sills (Unit 9) in semipelite (Unit 4), island in Brownell Lake, 2.9 km northeast of trapper's cabin.*

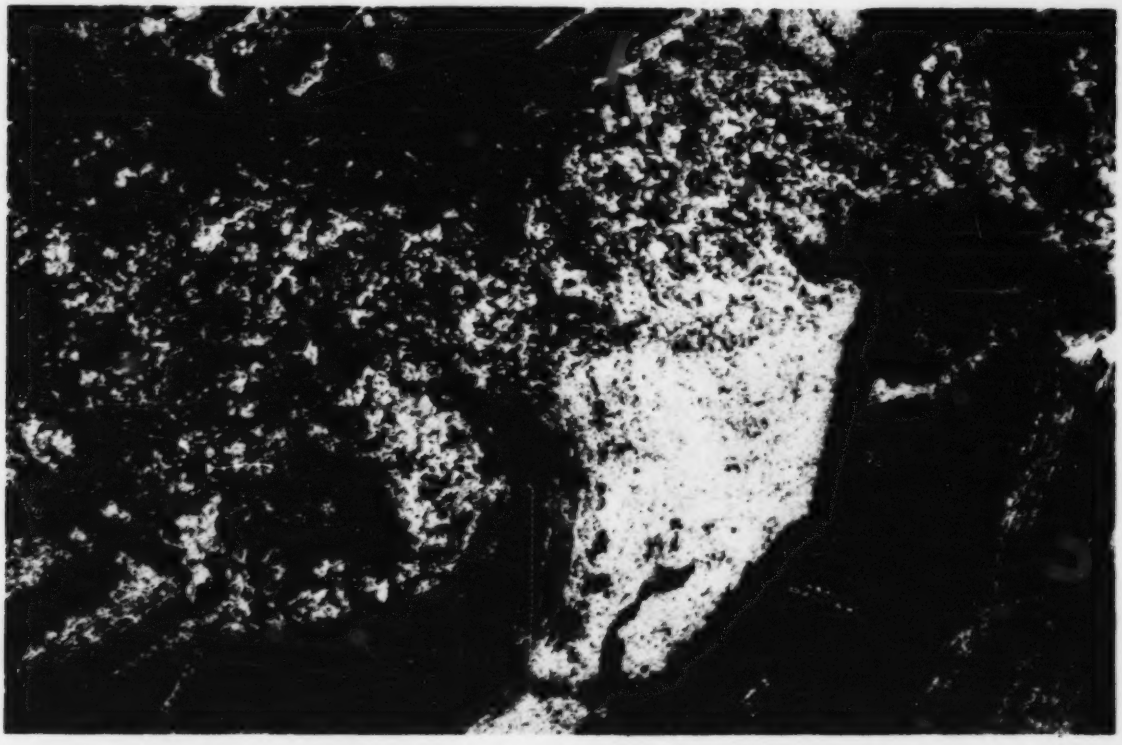

Plate 7b. *Same outcrop as Plate 7a. Late irregular pegmatite (Unit 10) is folded locally.*

Plate 8a. Meta-agglomerate (Unit 2) near outlet of Wolverine Lake, about 3.2 km northeast of Palf Lake.

Plate 8b. Same outcrop as Plate 8a, with feldspar porphyroblast development in clasts.

Plate 9a. Garnetiferous meta-agglomerate with sheared arkosic clast, 0.3 km northwest of outcrop in Plate 8b.

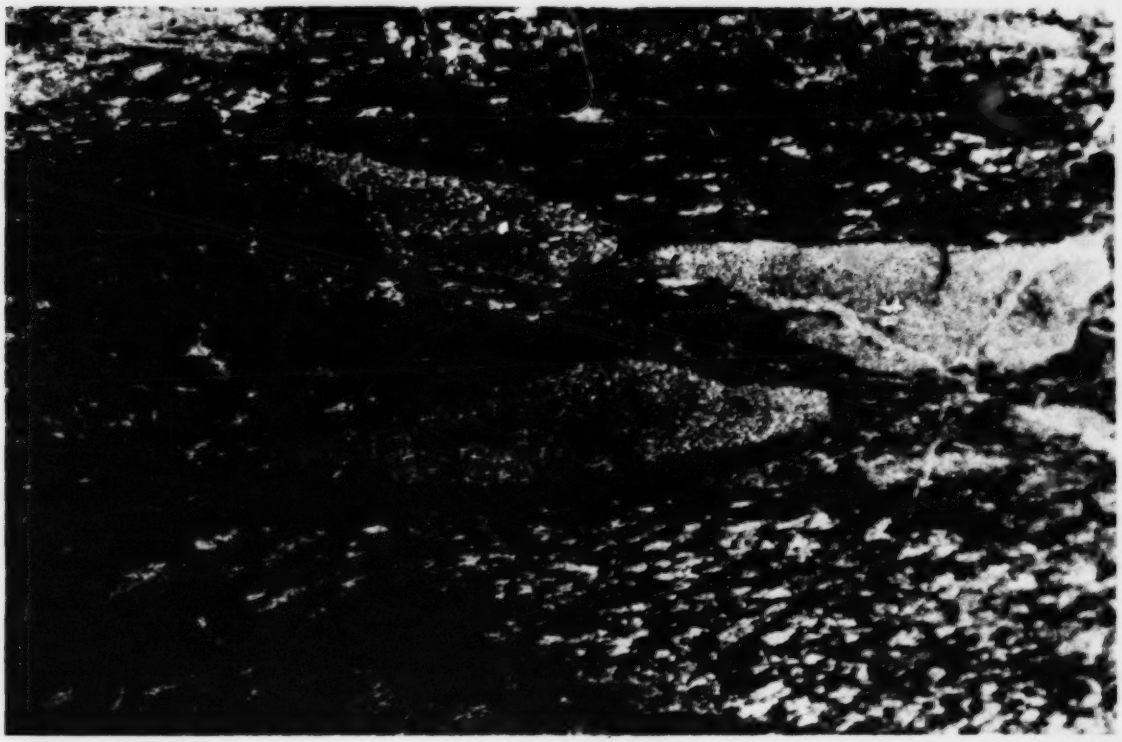

Plate 9b. Meta-agglomerate, southwest bay of Maynard Lake.

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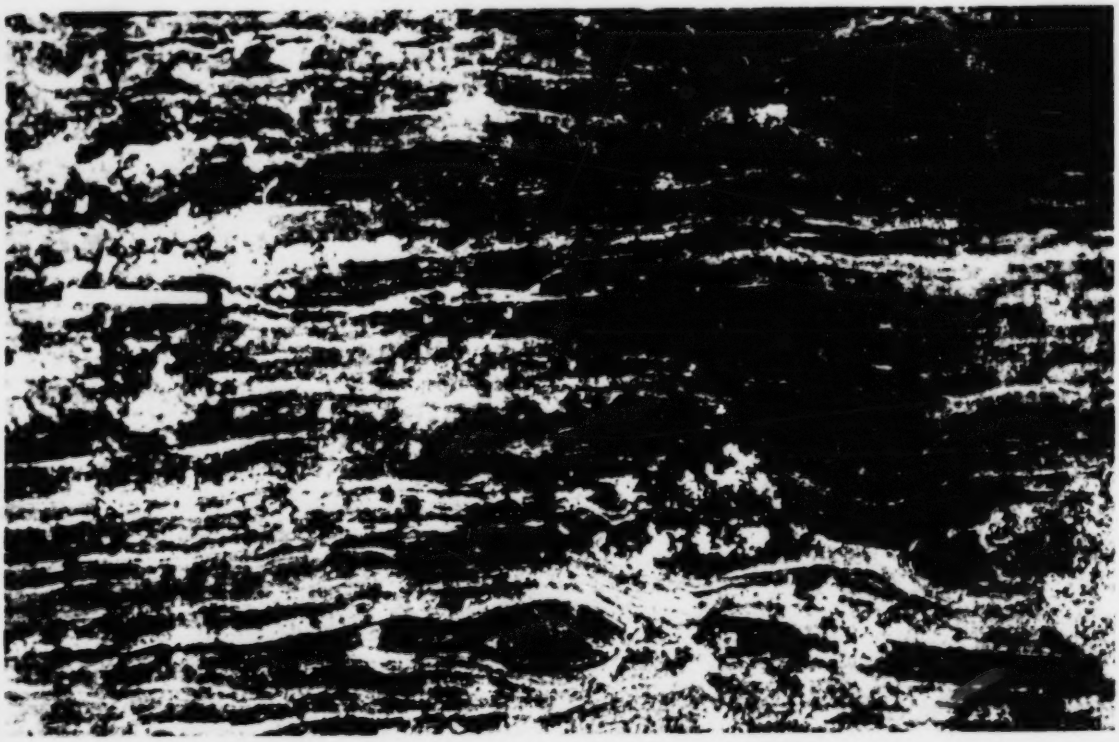


Plate 10a. Interbanded hornblende gneiss (Unit 2) and diopside gneiss (Subunit 2d), on island 1.0 km south of north end of Deschambault Lake.

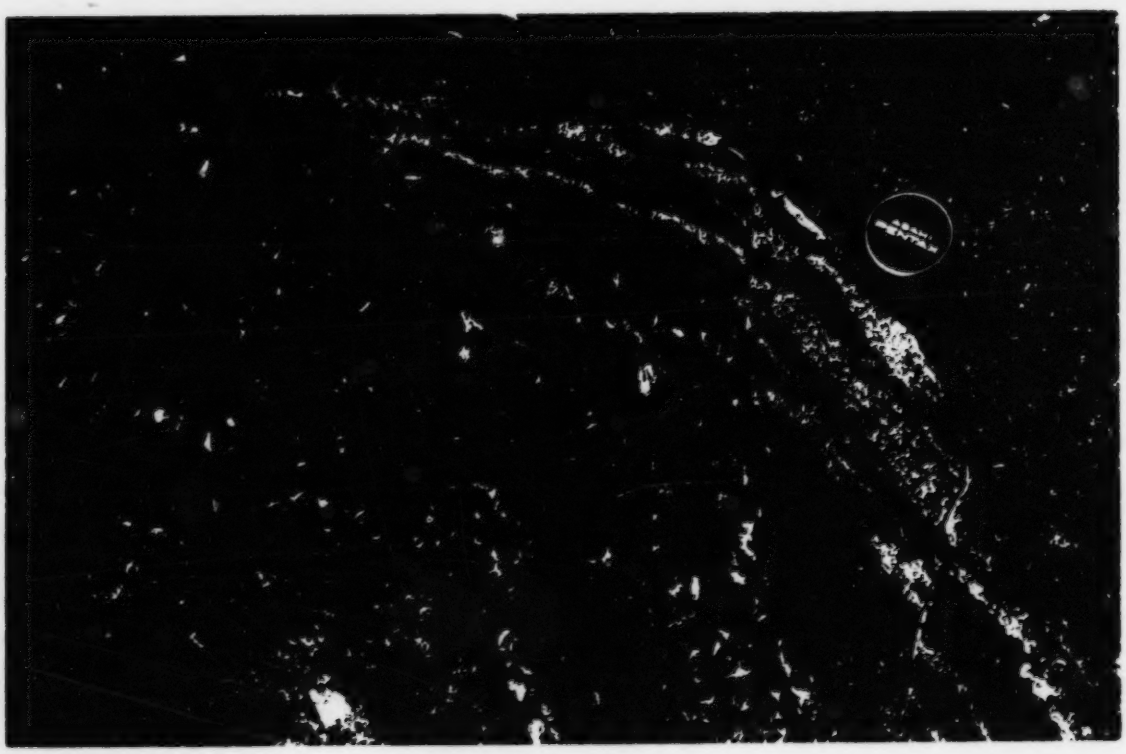
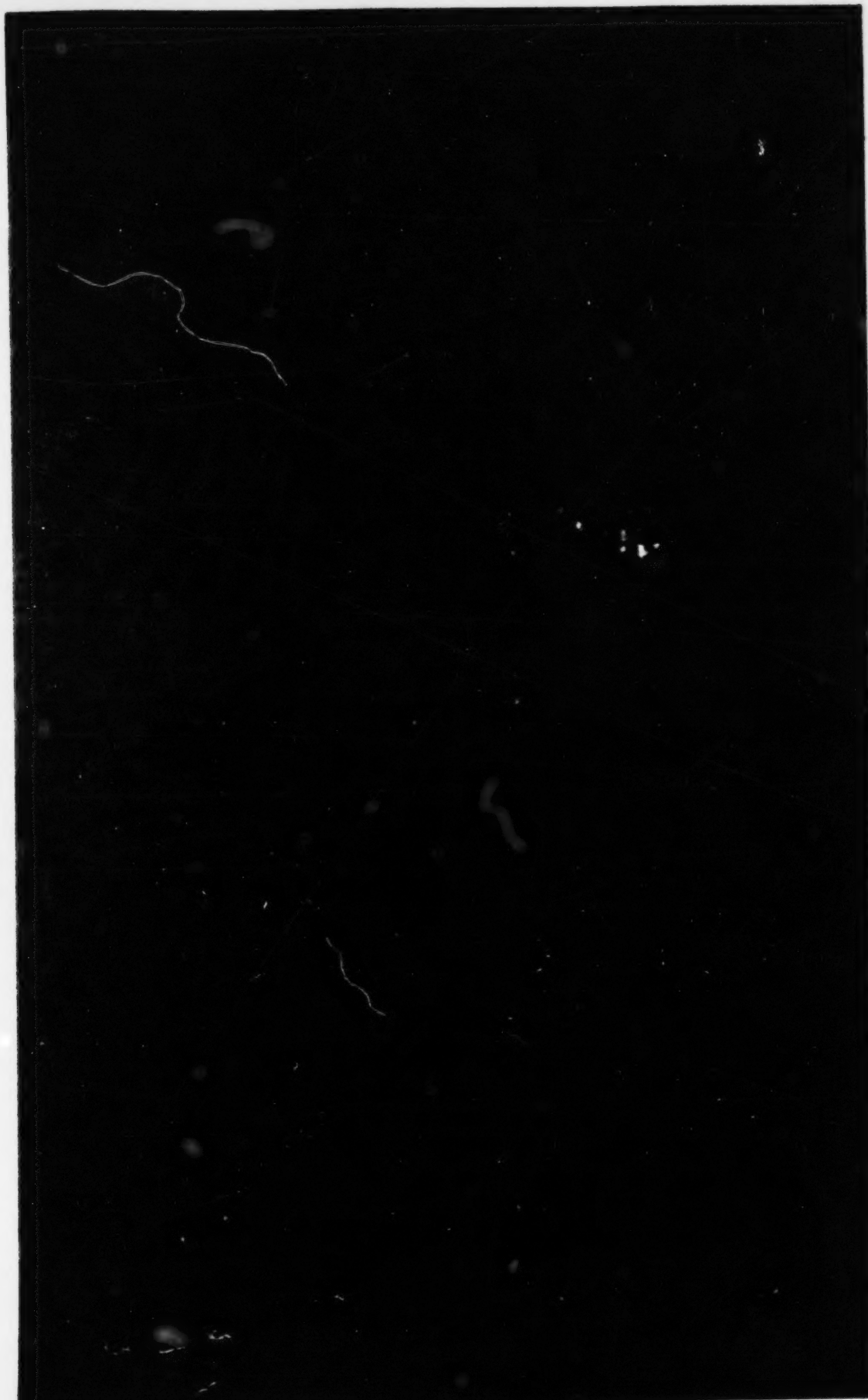


Plate 10b. Coarse-grained zone in hornblende gneiss (Unit 2), about 2.4 km northwest of north end of Deschambault Lake.



Saskatchewan
Mineral Resources

Saskatchewan Geological Survey

LEGEND

PRECAMBRIAN:

10 — **Pegmatite, granitic:**
- 10a, tourmaline pegmatite
- 10b, beryl pegmatite

9 — **Granite:**
- 9a, garnetiferous granite
- 9b, muscovitic granite

8 — **Granodiorite:**
- 8a, garnetiferous granodiorite
- 8b, undifferentiated granodiorite and granite

7 — **Diorite:**
- 7a, garnetiferous
- 7b, quartz diorite
- 7c, pyroxenite

6 — **Metaconglomerate**

Meta-arkose

4 — **Semipelite, garnetiferous:**
- 4a, semipelite with hornblende gneiss, pelitic rocks and meta-arkose

3 — **Pelitic rocks:**
- 3a, garnet-biotite gneiss
- 3b, muscovitic pelite and semipelite
- 3c, staurolite-garnet-biotite-muscovite gneiss
- 3d, phyllite
- 3e, porphyroblastic garnet-feldspar-biotite gneiss

2 — **Hornblende gneiss and associated metavolcanic rock:**
- 2a, garnet-hornblende gneiss
- 2b, metarhyolite
- 2c, metadacite
- 2d, diopside gneiss

1 — **Granitic gneiss:**
- 1a, garnet-quartz diorite gneiss

SYMBOLS

Lithological boundary (approximate, assumed)

Bedding (inclined, vertical, dip unknown, overturned)

40

35

30

Horst

Lake

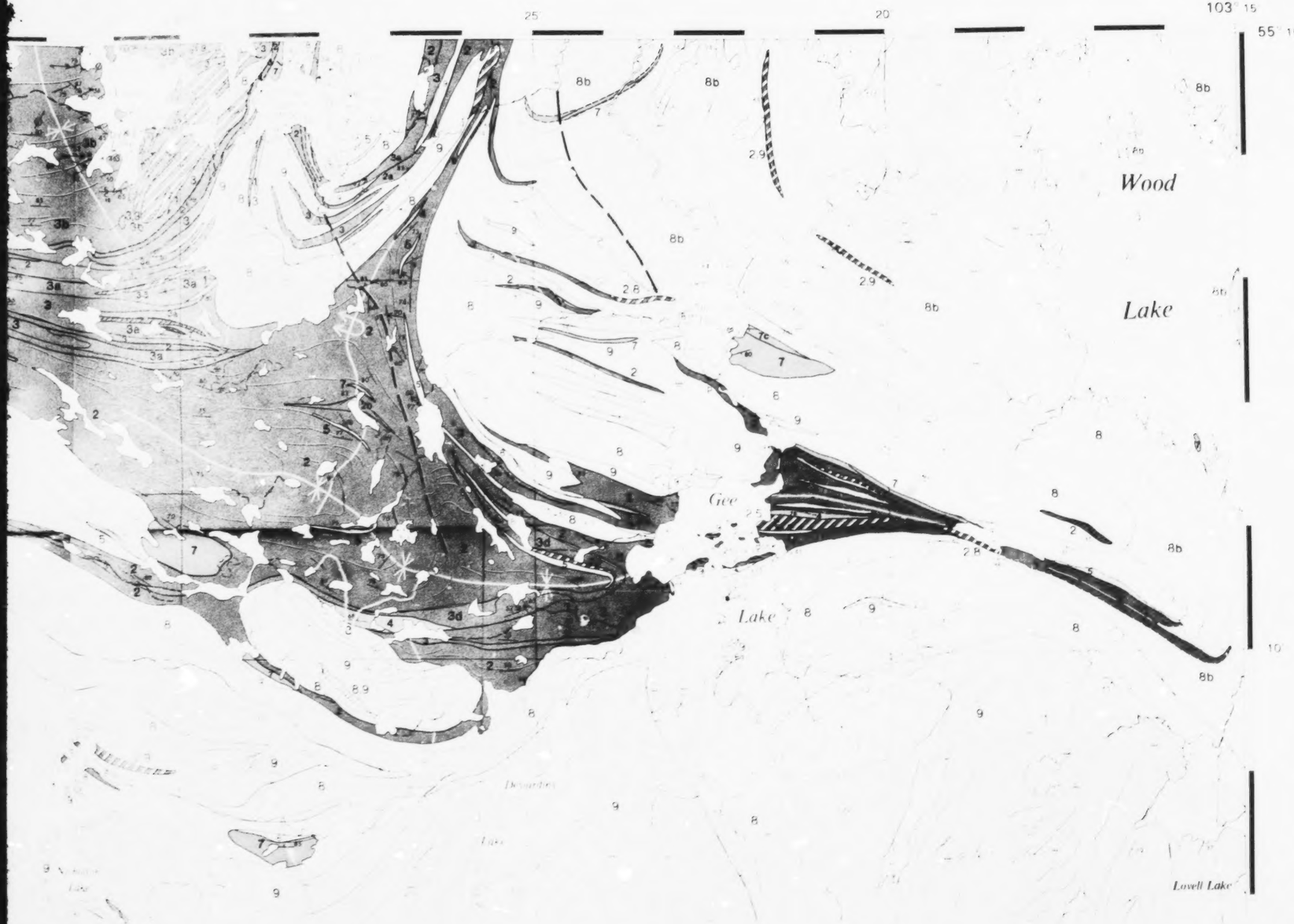
Birkett Lake

Lake

MAP 186A

GEOLOGY OF THE MAYNARD LAKE – SANDY NARROWS (WEST) AREA

63M-4 and 63M-3W



LOCATION MAP

1 Granitic gneiss
Migmatitic quartz and/or granitic

SYMBOLS

Lithological boundary (approximate, assumed)

Bedding (inclined, vertical, dip unknown, overturned)

Foliation (inclined, vertical, dip unknown, horizontal)

Younger schistosity (where more than one schistosity occurs)
(inclined, dip unknown)

Horizontal trace of axial plane of small-scale fold
(inclined, dip unknown)

Lineation (mineral lineation, small folds)

Trend lines of foliation, assumed

Antiform

Overturned antiform

Synform

Fault

Glacial striae

Crag and tail hill

Muskeg

Reef or small island

Stream (navigable, not navigable by canoe)

Portage

Rapid

Cabin

Local unofficial lake name (*Toro Lake*)

Mineralization
- chalcopyrite cp ×
- pyrite py ×
- pyrrhotite po ×
- tourmaline tl ×
- beryl by ×

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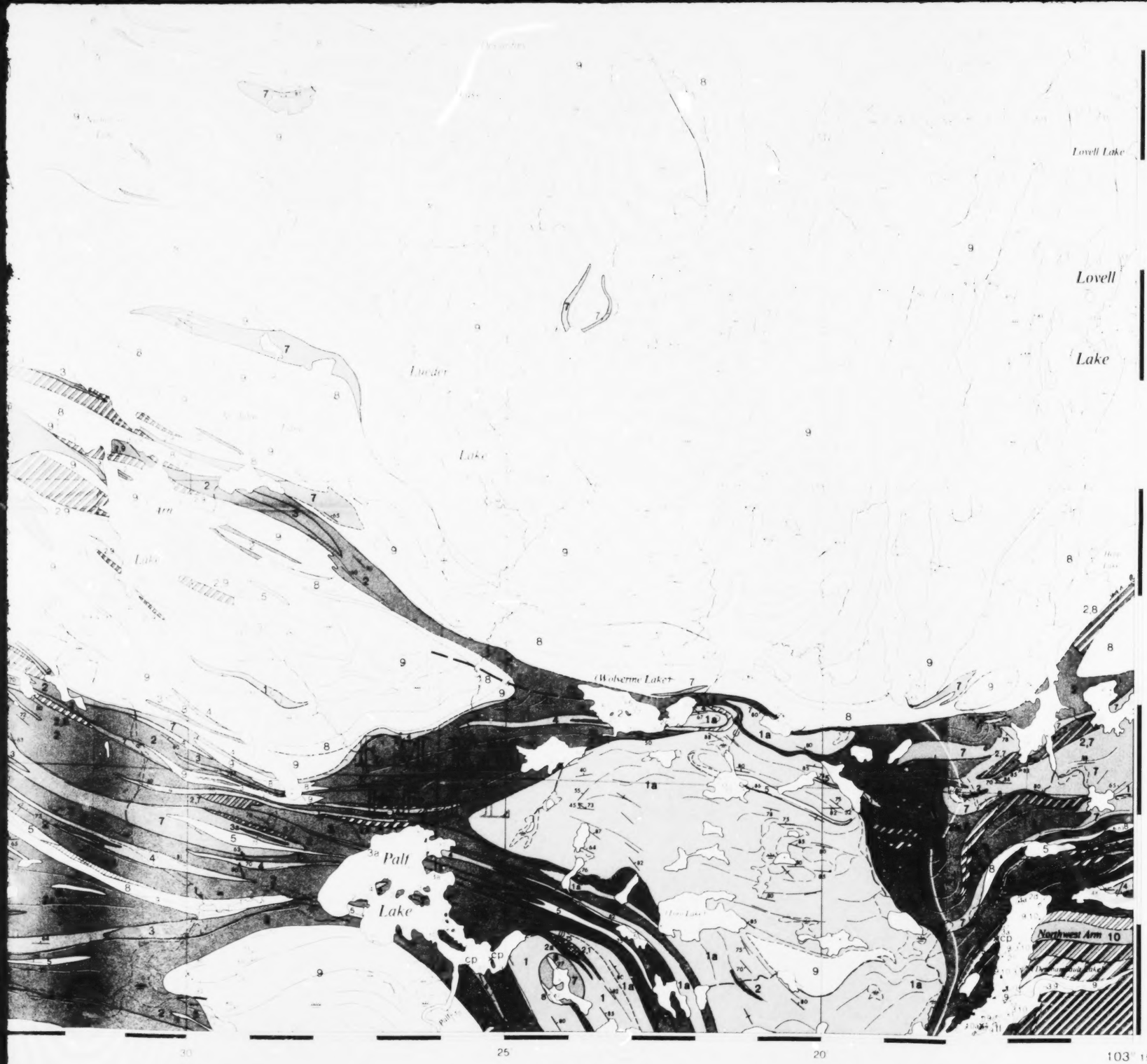

Geologically mapped in 1975 by Blaine P. Scott (project leader) and Douglas Cruikshank, and in 1976 by Blaine P. Scott (project leader) and Dev Sharma

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Cartography by A. H. Buyze

The base map was prepared from 1:50,000 scale topographic maps series A 742, edition 1, issued in 1971, published by the Department of Energy, Mines and Resources, Ottawa. Approximate magnetic declination at centre of map in 1969 was 15°28' decreasing 2.1' annually.

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MAP 186A to accompany Report 186

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